AN OVERVIEW

of

FREEWAY INCIDENT MANAGEMENT

in the United States

Col. Michael D. Robinson, Director
Michigan Department of State Police

Patrick M. Nowak, Director
Michigan Department of Transportation

January 1993

EXECUTIVE SUMMARY

Highway congestion is a daily occurrence in major cities throughout the United States, and according to the Michigan Department of Transportation, it is anticipated that by the year 2000 there will be a 50% increase in traffic on our highways. Approximately 60% of this congestion is due to non-recurring and unpredictable events caused by incidents such as stalled vehicles, flat tires, debris on the roadway, abandoned vehicles, and traffic accidents.

Studies have shown that approximately 80% of reported incidents are vehicle disablements, with minor accidents accounting for only 10% of these incidents. The rapid clearance of these incidents not only reduces motorist delays, but also reduces the probability of secondary incidents which are often more serious than the primary incident. The Federal Highway Administration has identified four management steps in establishing a successful freeway incident system:

* **Incident Detection**
* **Incident Response**
* **Incident Clearance**
* **Traffic Management and Motorist Information**

The Michigan Department of Transportation established a Freeway Incident Management System in the 1960's, and is currently monitoring 32 of the 64 freeway miles located within the City of Detroit. This system has been effective in providing **Incident Detection** and **Traffic Management and Motorist Information**, and close coordination with the Michigan State Police has improved **Incident Response** and **Incident Clearance** times dramatically.

Continued efforts to improve the safety of highway users in the Detroit area include:

* The consolidation of three State Police Posts to form a Metro North/South concept, resulting in easy access to the freeway system in order to provide needed services to motorists,
* Restoration of trooper strength at the Detroit Freeway Post,
* Installation of a state-of-the-art 800 MHz State Police radio system within the Michigan Transportation Center, scheduled for the fall of 1993, and
* A five-year expansion of the Freeway Incident Management System by the Department of Transportation to include all 230 miles of metro-Detroit area freeways.

The addition of Freeway Service Patrols would further enhance these efforts, as they have proven extremely effective in major cities throughout the United States. Upon reviewing a wide variety of programs throughout the country, it appears that a plan similar to that established in the Los Angeles area would compliment the current Freeway Incident Management System in Michigan.

Potential sources of funding for this program should be investigated by the Departments of State Police and Transportation, as well as the Detroit Alliance. Research indicates that a properly implemented Freeway Service Patrol in the Detroit area would not only provide a direct benefit to motorists, but a substantial amount of State Police patrol time could then be redirected towards traffic enforcement and accident reduction efforts, as well as the detection and deterrence of criminal activity.

FREEWAY INCIDENT MANAGEMENT

INTRODUCTION

Highway congestion is a daily occurrence in major cities throughout the United States, and according to the Michigan Department of Transportation, it is anticipated that by the year 2000, there will be a 50% increase in traffic on our highways. Congestion has two components: recurring congestion - the predictable delay caused by the high volume of vehicles using the highways; and non-recurring or "incident" congestion - the unpredictable delay caused by incidents.[1] "Incidents" include traffic accidents as well as a vast array of much smaller events, such as stalled vehicles, flat tires, debris on the roadway, spills, and abandoned vehicles.

It has been estimated that incidents account for approximately 60% of the vehicle hours lost to congestion.[2] Approximately 30% of these incidents are believed unreported, and are assumed to have little impact on traffic. Of the remaining 70% that are reported, approximately 80% are vehicle disablements, such as cars and trucks that have run out of gas, flat tires, overheating, etc. Accidents account for only 10% of these incidents.[3] Exhibit 1 is a composite profile of incidents drawn from the available research on freeway incidents.

These incidents create bottlenecks on the highway, slowing and often stopping the flow of vehicles. As a blocked lane of traffic chokes down the flow of traffic, a queue of vehicles builds upstream of the incident, which continues to build until the incident is cleared and traffic flow is restored. Additionally, opposing traffic flow is reduced by as much as 20% due to "rubbernecking," causing additional congestion.[4] Due to the huge reservoir of vehicles "dammed" up by an incident, it may take an extremely long time after the incident for the accumulated traffic to dissipate. Compounding this problem are secondary accidents occurring at the end of a queue as high speed traffic approaches an unexpected stopped or slow moving backup. Although quantifying secondary incidents is extremely difficult, a Minnesota DOT study found that 13% of all peak period accidents on one Minneapolis freeway were caused by a previous incident.[5]

This incident congestion can be minimized by diverting traffic before vehicles are caught in the traffic backup, and by clearing the incident as quickly as possible. The length of time required to report an incident and the resulting response time substantially compounds this problem, and major metropolitan cities throughout the country have been establishing programs to reduce congestion and manage freeway incidents.

These incident management programs generally involve the following four stages of management:

* **Incident Detection** to reduce the time it takes to detect and verify an incident has occurred;

* **Incident Response** to identify the nature of an incident and initiate the appropriate response;

* **Incident Clearance** to actually clear an incident completely from the roadway;

* **Traffic Management and Motorist Information** to minimize the disruption of the incident on the highway system by managing the traffic at the scene and providing up-to-date information to motorists to avoid being caught in the traffic backup.

EXISTING PROGRAMS

Chicago

Chicago implemented an Emergency Traffic Patrol (ETP) incident management program in 1960, and currently operates 58 "patrol vehicles" covering 100 miles of expressway 24 hours per day. This program has an annual operating budget of $3.5 million, and is funded from state gasoline taxes. The program is administered by the Illinois Department of Transportation, with vehicles being state owned and operators being state employees.[6]

The ETP vehicles are equipped and drivers are trained to handle most traffic incidents, including accidents, disabled vehicles, and small fires. Dubbed the "Minute Man Patrol," they assist with minor mechanical problems, and carry fuel, water, air for tires, and small tools that motorists can borrow. The Minute Men work closely with law enforcement and fire officials, moving quickly to relocate vehicles that are impeding traffic flow. The primary objective of the ETP is to reduce the exposure of disabled vehicle occupants to high volume/high speed traffic, and to get traffic on the expressway moving smoothly again. Towing is restricted to relocating vehicles only, with a final tow being done by private agencies.

The ETP fleet includes 35 emergency patrol vehicles, 9 light trucks, 3 heavy duty recovery trucks, a crash crane, a tractor retriever, a sand spreader, a heavy rescue and emergency lighting truck, and 4 portable changing message signs, operating 12 patrol assignments on overlapping shifts. In 1991, the fleet logged more than 1.7 million miles.[7]

ETP personnel receive special training in all phases of freeway incident management and specific strategies and operational techniques. In addition, they receive training in advanced first aid, CPR, fire fighting, extrication, radio communications, heavy equipment use, emergency recovery procedures, and hazardous materials.

In a recent independent study done for the American Trucking Association, the Freeway Incident Management program in Chicago was found to return $17.00 in benefits for every $1.00 invested.[8] According to the Illinois State Police, the Emergency Traffic Patrol is very effective, cutting back on the number of more serious incidents, and enabling police agencies to respond to more serious matters.[9]

Minneapolis

The Minnesota Department of Transportation initiated a "Highway Helper" program approximately three years ago, involving six vehicles patrolling the Minneapolis/St. Paul freeways during peak operating periods. Funding is being provided through Minnesota Department of Transportation maintenance funds, and they are struggling to expand to levels needed for an effective program. Local towing companies have strongly resisted this effort, and consideration is being given to contracting this service with private tow companies.[10]

A great deal of emphasis is currently being placed on incident detection which include 108 cameras to monitor traffic, 2,000 censors imbedded into the pavement, 30 changeable message signs to provide motorist information, dedicated radio stations to monitor traffic, and a cable channel that provides continuous and up-to-date information on the status of the highways.[11]

Denver

Denver, Colorado began a "Mile-High Courtesy Patrol" six-month pilot project in August 1992. Two types of patrols were established: (1) Colorado State Patrol with push bumpers are providing two vehicles during peak hours with off-duty officers being paid time and one-half. These vehicles are assigned a seven or eight mile stretch, and are dedicated to car assists and freeway incident management. (2) Tow trucks are operated on a 15 mile stretch during peak operating hours, Monday through Friday. These tow trucks provide a full range of services at no charge to stranded motorists and must be AAA certified.

This program is being evaluated by the University of Colorado with regard to cost effectiveness and motorist perception. Currently, this program is being funded through Colorado Department of Transportation construction funds, HPR funds, and 402 highway safety funds. When this program was initially established, the Tow Truck Association in Denver was invited to bid, however, did not indicate an interest in participating. Since that time, the independent tow companies have been causing some problems, complaining that they are not receiving their fair share of the business. The administrator of the plan advised these agencies that participation required only that they become AAA certified. This issue remains unresolved at this time. The initial bid by AAA wreckers for the six month contract was for $60,000, however, is "under bid," and will have to be recalculated.

Initial response to the program has been extremely favorable with approximately 400 cards being returned by motorists receiving assistance praising the program. The use of AAA tow trucks has appeared to be more successful than the use of state patrol vehicles, however, a final recommendation is pending.[12]

Los Angeles

In the 1970's, the California Highway Patrol (CHP) and the California Department of

Transportation (Caltrans) set up an incident management program in Los Angeles. This program began with a surveillance and control system operated by Caltrans, which has evolved from 42 miles in 1971 to currently covering more than 475 miles of freeway in the Los Angeles area. In addition, the system includes 750 ramp meters, 718 detector locations, 43 changeable message signs, and 15 cameras providing a close circuit television system.[13]

In July 1991, this program was expanded to include a Freeway Service Patrol (FSP). Under this program, CHP has statutory responsibility for overall management at the site of all freeway incidents, and Caltrans is responsible for system traffic control during major incidents and for maintenance support. Clearance of incidents is done by private tow truck operators under the direction of CHP.

At the end of 1992, the FSP was under contract with 88 private tow trucks to patrol the highways, which is being expanded to 140 tow trucks by April 1, 1993. These trucks patrol 250 miles of Los Angeles expressway, and provide as many as 1,000 assists each day. Although consideration was given to establishing a program similar to that in Chicago, it was decided to keep governmental involvement to a minimum, and contract with the private towing industry. Initially, the California Tow Truck Association threatened law suits, however, they are now reportedly very happy with the current program.[14]

This program is funded by a voter-approved 1/2 cent sales tax in Los Angeles County, which raises in excess of $60 million per year. The administration of this program costs approximately $14 million per year, allowing the expansion of incident detection systems to work in conjunction with the Freeway Service Patrols.

Caltrans and CHP provide daily field supervision, program management and contract administration. Caltrans and CHP have both dedicated staff to this program which is reimbursed by sales tax money. CHP staff currently includes one lieutenant, one sergeant, four traffic officers, and four dispatchers. Upon expansion of the program, two additional officers and two additional dispatchers will be added. Caltrans' staff includes a program evaluator, two field supervisors, and two dispatchers.

Each agency's primary role was based on that agency's strengths: dispatching and field supervision are the strength of the California Highway Patrol while Caltrans' personnel are suited for operations evaluation, fleet management, and evaluation. The California Highway Patrol reports they are *extremely* happy with this system, since it substantially frees up their officers for more critical needs.[15]

Currently, 203 miles of freeway are divided into 24 service areas or "beats" that are currently served by 88 tow trucks. These beats range between 5.7 and 13.4 directional miles. The number of trucks per beat is centered around a 15 minute response time.

Over 600 tow companies operating in the Los Angeles metropolitan area were requested to bid on this program. The bid specified tow truck equipment requirements, truck and uniform color requirements, driver requirements, and description of services to be provided by this program.

Tow companies are required to provide all equipment and supplies, including gasoline for tow truck operations, gasoline for motorists, and liability insurance. These vehicles are dedicated to Freeway Service Patrol during hours of operation only, and have removable magnetic decals that allow them to be used for the company's regular profit business while not in service.

Contracts are for variable time periods with the shortest contract having an 18-month time frame, and the longest being a 24 month time frame. The average cost per hour for these trucks has been established at $45.00. In addition, a dedicated communication system was provided in these vehicles, which was paid from the sales tax increase. Each of the Freeway Service Patrol tow trucks, as well as the seven supervisory vehicles, are equipped a dedicated communication system that links them with the Caltrans Operation Center and the CHP Communications Center, including voice radio equipment, mobile digital data systems for two-way non-voice communication, and a teletrack automatic vehicle location system which enable both Caltrans and CHP dispatchers to determine the location of all 88 tow trucks at all times during metro Freeway Service Patrol operations.

Drivers must meet strict criteria, and are subject to driving record and criminal background checks. They are required to complete tow operation proficiency tests and attend a mandatory two-day certification program. No tow truck operator is allowed to work unless certified and approved by Caltrans and CHP. All Freeway Service Patrol drivers are required to wear contractually specified uniforms.

Operators patrol their assigned beats, and are responsible for clearing freeways of automobiles, motorcycles, and small trucks with a gross vehicle weight of less than 6,000 pounds, including the changing of flat tires, providing jump starts, and providing a maximum one gallon of gasoline. All services are provided free of charge to the motorist, and a time allocation of no more than ten minutes is allowed per disablement. If necessary to tow, vehicles are taken only to pre-designated drop locations, at which time the motorist can request the Metro FSP operator to call the CHP to request a rotation tow, specific tow, or friend to assist them.

Since its inception on July 1, 1991, over 60,000 disabled vehicles and those involved in minor accidents have been assisted. Motorist surveys show the program has a 98% approval rating. The program has proven to be extremely cost effective due to the competitive bidding process, and is believed more cost effective than a state operated program using state employees and resulting salaries.[16]

Michigan

The Michigan Department of Transportation first established television surveillance in the Detroit area in the 1960's, being the first in the country to develop a freeway incident management system. Currently, closed circuit television monitors 32 of the 64 freeway miles located within the City of Detroit, in conjunction with 1,350 loops embedded in the pavement in the same area. In 1981, MDOT implemented a project to reduce rush hour traffic congestion, provide instant management, and supply traffic information to motorists. This project included four systems: (1)

surveillance cameras, (2) changeable message signs, (3) motorist aid telephones (which have since been discontinued due to old technology and maintenance expense), and (4) ramp metering.

The Department of Transportation currently operates a control center at Sixth and Howard Streets, which continuously maintains surveillance on these 32 miles of roadway. The 1,350 loops imbedded in the pavement are connected to traffic detectors that sense the presence of vehicles, relaying that information to computers that translate the information into traffic volume and speed information. This information is then sent to a computer within the control center that determines the operation of other subsystems, which control ramp metering, and activate changeable message signs in order to reroute traffic as quickly as possible. In the event an incident is detected, cameras verify the incident, and this information is relayed to the State Police.

This program has been highly successful, the Michigan Emergency Patrol in the Detroit Metropolitan area reporting that 6,444 incidents were reported on this system through October 1992. Except for the motorist aid telephone systems, a five year plan to expand this program is in place, and eventually all 250 miles of Detroit metropolitan area expressways will be included.

Exhibit 2 provides a complete overview of this program.

Other programs

According to the Federal Highway Administration, approximately 30 variations on these Freeway Incident Management programs are in operation throughout the United States. The FHA is extremely supportive of these programs, and some funding is available for these types of programs. A substantial amount of research and framework for developing these programs have been developed by the Federal Highway Administration, and symposiums are being conducted throughout the country sponsored by FHA.[17] The following is a summary of the types of Freeway Incident Management Programs currently in operation:[18]

* **Emergency Traffic Patrol**, such as the Illinois Minute Man program.

* **Freeway Courtesy Patrol**. A number of State Departments of Transportation are now operating light duty pickup trucks as courtesy patrols, which provide gas, water, jump starts, pushes, and other motorist assistance on urban freeways. This is being done in Virginia, Maryland, Texas, Minnesota, and in the east St. Louis, Illinois area. These patrols usually operate on weekdays during the morning and evening peak periods, providing between 5 and 15 assists per day, per vehicle.

* **Bridge and Tunnel Patrols**. Many service patrols have been established to operate on bridges or tunnels throughout the country. The Florida Department of Transportation is operating two bridge service patrols, one in Tampa and the other in Jacksonville to improve response capabilities and keep traffic moving on the bridges where severe width restrictions and peak traffic volumes make it

imperative that all lanes be kept open. A wrecker is stationed on each end of the three-mile long bridge during peak periods, responding to Florida Highway Patrol requests when an incident occurs. Each half-hour the wreckers routinely switch ends of the bridge, looking for incidents or debris along the way.

A similar service patrol is operated by the Virginia Department of Transportation on the Hampton Roads bridge tunnel and the James River Bridge in southeastern Virginia. Approximately 3,000 assists are provided each year on the James River bridge, and over 6,000 assists each year on the Hampton Roads bridge.

* **Police Sponsored Service Patrols**. Columbus, Ohio currently operates three shifts of specially equipped police cruisers on 88 miles of freeway. These cruisers are equipped with jumper cables, gasoline transfer systems, push bumpers, water containers, and other equipment to provide motorist assistance. A wrecker is also assigned to patrol the freeways during peak periods, and all new recruits are trained in incident management procedures.

  In Virginia, a State Police Motorist Assistance Aid program was established in Richmond, utilizing part-time "motorist aid officers," who receive 80 hours of training. These officers are not sworn police officers, however, operate refurbished backup police cruisers on Richmond freeways that are equipped with amber warning lights, push bumpers, state police and CB radios, a gas transfer system, and tools to provide minor repairs. These motorist aid officers are closely monitored to assure their function is kept in proper perspective. This program is funded with state transportation funds.

* **Samaritan Program**. Currently operating in a number of communities in Massachusetts, Connecticut, Rhode Island, New York, and Pennsylvania, is a corporately sponsored community service known as the Samaritan Emergency Response Vehicle (SERVE). The Samaritan approach is the result of over ten years of experience, development and testing, with operators of these vehicles natives of the patrol area. Operators receive two to four months of intensive training with experienced Samaritans.

  Training includes safety, emergency mechanics on the highway, traffic pattern analysis and reporting, and an emergency medical technician's certification. Vehicles consist of three-quarter or one-ton vans that have the sponsoring company logo prominently displayed, with safe lighting to protect disabled motorists, communications equipment, and a push bar to remove most disabled vehicles from the roadway. Gasoline, oil, transmission fluid, a tool set, fire extinguisher, medical kit, and other miscellaneous equipment is included in the well-equipped vans enabling the Samaritan Patrol to provide a variety of motor services, including many temporary roadside repairs. These patrols cover between 150 and 300 miles each day during peak operating periods looking for stranded motorists. All services are provided at no cost to the motorist.

The question of competition with private towing companies has frequently been raised, however, the program continues to exist on the premise that exposure time is minimized and they are willing to work in conjunction with private towing firms.

* **Patrols Sponsored by Radio Stations**. In some areas of the country, such as Seattle, Washington, local radio stations provide on-road assistance for motorists, with vans providing gas, oil, tires, and pushes to disabled motorists at no charge. A Detroit radio station provided a similar service for a six month trial period, however, discontinued the program due to a shortage of funding.

* **Service Patrols During Major Highway Construction**. The Florida Department of Transportation has sometimes included special provisions requiring contractors to furnish Freeway Service Patrol Vehicles and operators during reconstruction of certain portions of expressway. These vehicles are equipped similar to those described previously, and are restricted to operate within one-half mile range of the interstate in order to provide immediate assistance to motorists affected by the reconstruction. Similar efforts are being made in both Illinois and Connecticut.

In many areas of the country, including Michigan, state police agencies have installed push bumpers on patrol vehicles, enabling them to remove vehicles from the roadway that are involved in minor incidents. Additionally, the increasing popularity of cellular telephones have been a direct benefit in the prompt reporting of incidents. Still, confirmation of the nature of the incident and other extenuating circumstances must be made. It is believed that cellular telephones may become one of the more comprehensive incident detection techniques available. One of the complicating factors to these reports, however, is that those making the calls often do not know the exact location of the incident. Some have only a vague idea of where they are.

In the northern Virginia area, two cellular companies, Bell Atlantic and Cellular One, the Virginia Department of Motor Vehicles, Fairfax County, Arlington County, and the northern Virginia Planning District Commission joined together to fund and implement a public information program to educate cellular phone users on the proper use of 9-1-1 to report emergencies. Included was an educational brochure and poster aimed at users, and instructions and training designed to make operators aware of the special considerations necessary to handle cellular calls effectively.

Exhibit 3 provides a complete list of incident management programs in the United States.

Funding of Freeway Service Patrols

Freeway Service Patrols throughout the country are funded in a variety of ways. Illinois uses a state gasoline tax, while Los Angeles County residents approved a one-half percent sales tax increase dedicated for this purpose. Other parts of the country have Freeway Service Patrols that are totally sponsored by private agencies, while others are being paid through general state fund monies. Denver, Colorado is currently using a combination of highway maintenance funds and

federal grant money to provide these services.

The Federal Highway Administration provides funding to establish a Freeway Service Patrol through primary, urban and interstate 4-R funds. In addition, day-to-day operational costs for a Freeway Service Patrol are available when operated as part of a traffic management program during major highway reconstruction.

SUMMARY

Freeway Service Patrols have proven extremely effective in major cities throughout the United States. According to a study completed by the Federal Highway Administration,[19] 80% of the total incident delays on urban freeways occur during peak periods. Separate studies conducted in Virginia, California, Texas, and Minnesota found that 80% of all urban freeway incidents are actually minor, while only 2% of all incidents last more than two hours. This study also revealed that approximately one-third of total vehicle delays were due to lane blocking accidents, with the remaining two-thirds due to minor incidents that can be resolved through the use of Freeway Service Patrols. Although some private towing companies have asserted that the use of Freeway Service Patrols constitute unfair competition with their business, this has not been the case, and the courts have not supported this assertion.[20] A model plan for utilizing pre-qualified private towing contractors has even been developed by the Towing Recovery Association of America.[21]

The primary objective of Freeway Service Patrols are to minimize the duration of an incident by the fast removal of these incidents, thereby reducing the risks to motorists and response personnel. The rapid handling of these incidents not only reduces motorist delays, but also reduces the probability of secondary incidents which often are more serious than the primary incident.

The financial impact of traffic delays due to congestion and incidents is less readily apparent, however, equates to a staggering amount each year. Commercial vehicles, earning an estimated $25.00 per hour, and regular passenger vehicles, estimated to waste $6.00 an hour, multiplied by millions of vehicles and thousands of incidents each year amount to a staggering sum. Based on 1984 data compiled by the Federal Highway Administration, user costs were calculated to exceed $5 billion per year in time delays and wasted fuel. This study predicts that due to increased traffic volumes and subsequent congestion, costs will exceed $35 billion per year by the year 2005 if significant improvements are not made.[22] In addition, unnecessarily burned fuel increases the pollutants in the air.

RECOMMENDATIONS

The Michigan Department of Transportation has taken an aggressive posture in establishing a Freeway Incident Management System in the Detroit area and plans to expand this system to continue reducing traffic congestion. This system has been effective in providing two of the four management stages identified by the Federal Highway Administration in effective freeway incident management:[23] **Incident Detection** and **Traffic Management and Motorist Information**.

Working with the Michigan Department of State Police by promptly reporting incidents requiring immediate attention, the remaining two stages of **Incident Response** and **Incident Clearance** times have been improved dramatically.

Based on the experiences of other large metropolitan areas across the country having similar traffic congestion, however, additional steps appear necessary in order to provide **optimal** Incident Response and Incident Clearance. In the event the need for a Freeway Service Patrol in the Detroit area is substantiated, a plan similar to that established in the Los Angeles area would compliment both the existing and proposed expanded Freeway Incident Management System currently being administered by the Department of Transportation. The use of private wreckers under the close scrutiny of the State Police would also fit into the current administration's emphasis on downsizing state government more-so than a plan similar to the "Minute Man" Emergency Traffic Patrol that is currently successfully operating in the Chicago area.

Another option would be corporately sponsored service patrols with volunteers such as the Samaritan program, having no governmental involvement or regulation. Current Michigan law would severely restrict this type of operation, however. Anticipated resistance by the towing industry, combined with liability concerns, virtually assures a change in the law would not be well received, making this alternative less than viable.

The state administered Freeway Service Patrol concept has proven to be both popular and cost effective, and potential sources of funding for this program should be investigated by the Departments of State Police and Transportation, as well as the Detroit Alliance. Statistics compiled from the State Police Officers' Daily System seem to substantiate a need for such a program: car assists in the Detroit metropolitan area *by State Police cars alone* exceed 36,000 each year.[24] Not only would motorists realize a direct benefit by these patrols, according to studies cited earlier in this report, approximately 80% of these car assists could conceivably be handled by a Freeway Service Patrol. As experienced by the California Highway Patrol, this would result in freeing a substantial amount of State Police patrol time, which could then be better utilized for speed and accident reduction efforts.

Endnotes

[1] Cambridge Systematics, Inc., Incident Management, Executive Summary, page 5, October 1990.

[2] Ibid.

[3] Ibid, page 7.

[4] Robinson, James, What's New in . . . Freeway Incident Detection and Response, Federal Highway Administration, page 250, Technical Papers from ITE's 1990, 1989, and 1988 Conferences.

[5] McDade, Jonathon D., Highway Engineer, Freeway Service Patrols: A Versatile Incident Management Tool, Federal Highway Administration, page 5, July 1989.

[6] Smith, Arland T., Introduction to the Illinois Department of Transportation Emergency Traffic Patrol, Illinois Department of Transportation, Rev. 8-1-92.

[7] Ibid, page 3.

[8] Op. cit., page 1.

[9] Telephone conversation with Lt. Dennis Lovell, Chief of Staff, Staff Services Command, Illinois State Police, 12/9/92, (217) 782-6268.

[10] Cambridge Systematics, Inc., Incident Management, Executive Summary, page 17, October 1990.

[11] Telephone conversation with Mr. Glen Carlson, Project Director, Minnesota Department of Transportation, 12/22/92, (612) 341-7500.

[12] Telephone conversation with Joni Brooks, Contract Administrator, Colorado Department of Transportation, 12/22/92, (303) 757-9511.

[13] Judycki, Dennis C., and Robinson, James, Freeway Incident Management, page 363, Technical Papers from ITE's 1990, 1989, and 1988 Conferences, no date.

[14] Telephone conversation with Lt. Bill Pasley, Freeway Service Patrol Administrator, California Highway Patrol, 1/5/93, (213) 736-2991.

[15] Ibid.

[16] Cashin, Robert D., et. al., A Case Experience: Los Angeles Metro Freeway Service Patrol, A Public-Private Partnership, South Bay Los Angeles County Transportation Commission, December 1991.

[17] Telephone conversation with James R. Robinson, Urban Mobility Engineer, Federal Highway Administration, Region III, 12/16/92, (410) 962-3815.

[18] McDade, Jonathon D., Highway Engineer, Freeway Service Patrols: A Versatile Incident Management Tool, Federal Highway Administration, pages 8 - 12, July 1989.

[19] Lindley, Jeffrey A., Quantification of Urban Freeway Congestion in Analysis of Remedial Measures-Update, Federal Highway Administration, April 1989.

[20] Op. Cit.

[21] Model Plan for Highway Service Patrol System Utilizing Pre-qualified Private Towing Contractors, Towing Recovery Association of America, no date.

[22] Op. Cit.

[23] Op. Cit., page 1.

[24] Recorded car assists for the Second District compiled by Michigan State Police, Criminal Justice Data Center: 1990, 36,985; 1991, 32,250; 1992 (through 10/92), 36,985.

Prepared by Sgt. Eric Johnson
Michigan Department of State Police